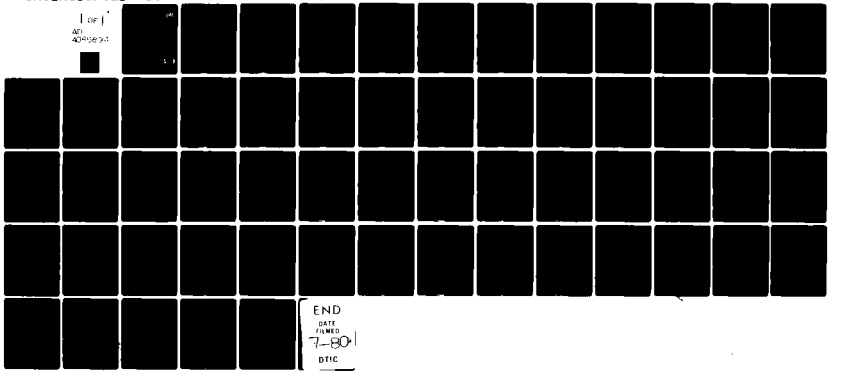
AD-A085 634 COMMAND AND CONTROL TECHNICAL CENTER WASHINGTON DC F/G 15/7
THE CCTC QUICK-REACTING GENERAL WAR GAMING SYSTEM (QUICK) USERS--ETC(U)
APR 80
UNCLASSIFIED CCTC-CSM-UM-9-77-V3-CH-2 NL



END
DATE FILMED
7-80
DTIC

DEFENSE COMMUNICATIONS AGENCY
COMMAND AND CONTROL TECHNICAL CENTER
WASHINGTON, D. C. 20301

LEVEL III

IN REPLY REFER TO: C314

30 April 1980

TO: RECIPIENTS

SUBJECT: Change 2 to Users Manual CSM UM 9-77, Volume III, Allocation Subsystem

1. Insert the enclosed change pages and destroy the replaced pages according to applicable security regulations.

2. A list of Effective Pages to verify the accuracy of this manual is enclosed. This list should be inserted before the title page.

3. When this change has been posted, make an entry in the Record of Changes.

FOR THE DIRECTOR:

J. DOUGLAS POTTER
Assistant to the Director
for Administration

31 Enclosures
Change 2 Pages

EFFECTIVE PAGES - APRIL 1980

The list is used to verify the accuracy of CSM UM 9-77, Volume III after change 2 pages have been inserted. Original pages are indicated by the letter 0, change 1 pages by the numeral 1, and change 2 pages by the numeral 2.

Page No.	Change No.	Page No.	Change No.
Title Page	0	70-71	2
ii-iii	2	72-86	0
iv-v	1	87	2
vi	0	88-102	0
vii	1	103-103.2	2
viii	2	104-106	0
1	0	107	1
2	2	108-110	2
3-5	0	111	0
6-7.2	2	112-113	2
8-9	1	114-115	0
10-10.1	2	116	2
10.2	1	117	0
11	1	118	2
12	0	119	2
13-21	1	120-122	0
22	2		
23	1		
24	2		
25-30	1		
31	0		
32-33	1		
34	2		
35-37	2		
38-41	1		
42-44	0		
45	1		
45.1-45.2	1		
46-48	0		
49	1		
50-51	0		
52	1		
53-55	0		
56-57	2		
58	0		
59	2		
60-61	0		
62	2		
63-69	0		

ACKNOWLEDGMENT

This document was prepared under the direction of the Chief for Military Studies and Analyses, CCTC, in response to a requirement of the Studies, Analysis, and Gaming Agency, Organization of the Joint Chiefs of Staff. Technical support was provided by System Sciences, Incorporated under Contract Number DCA100-75-C-0019. Change set one was prepared under Contract Number DCA100-78-C-0035. Computer Sciences Corporation prepared change set two under Contract Number DCA 100-78-C-0042.

CONTENTS

ABSTRACT

The computerized Quick-Reacting General War Gaming System (QUICK) will accept input data, automatically generate global strategic nuclear war plans, provide output summaries, and produce input tapes to simulator subsystems external to QUICK. QUICK has been programmed in FORTRAN for use on the CCTC HIS 6000 computer system.

The QUICK Users Manual consists of four volumes: Volume I, Data Management Subsystem; Volume II, Weapon/Target Identification Subsystem; Volume III, Weapon Allocation Subsystem; Volume IV, Sortie Generation Subsystem. The Users Manual complements the other QUICK Computer System Manuals to facilitate application of the war gaming system. This volume, Volume III, provides detailed instructions for execution of the Weapon Allocation Subsystem and the modules it comprises. Companion documents are:

a. PROGRAM MAINTENANCE MANUAL
   Computer System Manual CSM MM 9-77, Volume I
   Computer System Manual CSM MM 9-77, Volume II
   Computer System Manual CSM MM 9-77, Volume III
   Computer System Manual CSM MM 9-77, Volume IV
   Provides detailed instructions for maintenance of the system.

b. TECHNICAL MEMORANDUM
   Technical Memorandum TM 153-77
   Provides a nontechnical description of the system for senior management personnel.

SECTION 1. GENERAL

1.1 Purpose

This volume of the QUICK Users Manual informs the CCTC user/analyst in the preparation of control cards, structure of execution (run) decks, preparation of computer job requests, and in the analyzation of the associated computer output, to include the recognition of error messages for the Weapon Allocation subsystem of QUICK. It complements information contained in the Program Maintenance Manuals of the QUICK System. The abstract of this document references other documents describing QUICK.

1.2 General Description

The Weapon Allocation subsystem uses the integrated data base as defined by all preceding modules and produces a plan using the weapon resources specified to maximize the expected target value destroyed. The subsystem consists of modules PREPALOC, ALOC, EVALALOC, and ALOCOUT, as shown in figure 1. Figure 2 shows the relationship of the Weapon Allocation subsystem to other QUICK subsystems in terms of procedural and information flow.

The modules and supporting subroutines of this subsystem are used to define information for use in later processes and allocate given weapons to targets to optimize expected value destroyed. Modules for this subsystem must be executed sequentially in the order presented within figure 1 (EVALALOC is an optional execution).

The first module, PREPALOC, precomputes much of the information required by later processors. It organizes the input data for efficient use by other components of the Weapon Allocation Subsystem. In addition, it provides capabilities for planning factor modification and fixed weapon assignment specification.

The basic data manipulated by this module include the distance and attrition factors for the weapons, the geographic description of the bomber penetration and depenetration corridors, the weapon characteristic tables (e.g., warhead and payload tables), and the target characteristics.

The next module, ALOC, performs the allocation of weapons to targets. Using a generalized Lagrange multiplier method, an optimal allocation is generated subject to several forms of user-input allocation constraints. These constraints include specification of minimum and maximum desired damage levels, restriction of weapons to specified subsets of the target system, and specification of weapons allocated to specific targets by the user. Within these constraints, the module generates the allocation which maximizes the expected value destroyed in the target system. Module ALOC is also referred to as the Allocator.

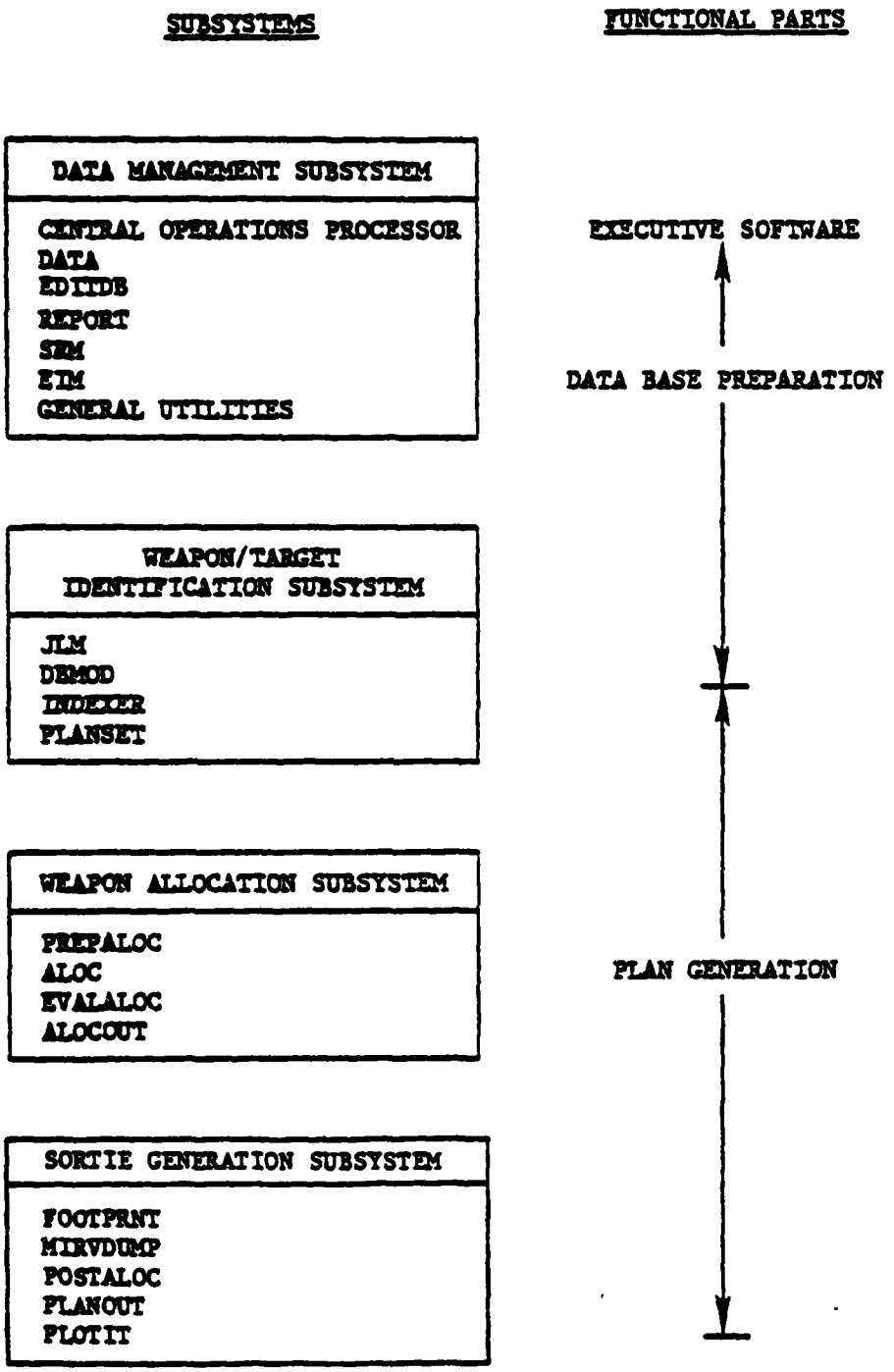


Figure 1. Major Subsystems of the QUICK System

SECTION 2. MODULE PREPALOC

2.1 General Purpose

Module PREPALOC (executed after PLANSET) has four major capabilities: updating of weapon group and target attributes, modification of target values, damage constraints and height-of-burst specification, preparation of data for the fixed weapon assignment capability of module ALOC, and the geographical related parameters.

Weapon groups formulation resides within module PLANSET. PREPALOC permits the user to add weapon strikes (called overallocation) to weapon groups whereby providing the allocation greater flexibility in making assignments which ignore serial constraints. The allocator attempts to assign the true inventory plus the added weapons. The Sortie Generation subsystem selects only the inventory number of strikes.

The second major capability of this module is the modification of the target characteristics, VTO, MINKILL, and MAXKILL. VTO is the value of the target relative to the others. MINKILL is the minimum fraction of value that must be destroyed, and MAXKILL is the maximum desired fraction destroyed. Any of these parameters may be changed for any target. The change requests can change these parameters for a single target or for a set of targets. The set of targets for which a change is requested is identified by target class, type, and individual identifier (target designator code (DESIG)), or any combination of these. For complex targets, the class, type, and designator code of each component will be checked to determine if a target parameter for the complex is to be changed.

An additional planning factor which can be modified in this program is weapon height of burst. In the absence of any user specifications, QUICK uses the height of burst for each weapon/target combination that produces the most damage. However, the user can specify use of air or ground bursts in preference to the optimal height. The user can request ground or air bursts on the basis of weapon type, target designator code, target type, target class, target country location, or target region.

The third major capability is the request for allocation of specific weapons to specific targets. (These requests are called "fixed assignments.") This fixing of weapons to targets enables the user to determine part of the weapon allocation while leaving the allocation module free to determine the remaining allocation. In addition, the time of arrival at target or salvo launch number can be fixed for missile weapons. This information will be passed to module PLANOUT which will adjust the launch time accordingly. The specified fixed assignment of weapons remains in effect for the remainder of the plan generation process. Later modules will retain the assignments as best possible.

(For example, it is possible to fix a set of weapons from a weapon group with multiple independently targetable reentry vehicles (MIRV) in such a manner that there are no feasible footprints that cover that target set adequately. In that case, some of the fixed assignment requests must be ignored.)

The fourth major capability is the calculations and IDS storage of all distances and attrition between corridor doglegs for use by other processors. Also the distance between depenetration corridor and recovery bases is calculated and stored.

2.2 Input

2.2.1 General. Text English commands to this module permit the setting of new target values, MINKILL or MAXKILL as well as specifying weapon height of burst. Also certain gaming parameters are set which define the game to be executed. One final consideration is permitting the user to directly assign weapons to individual targets.

This module recognizes the verb PREPARE and adverbs SETTING, FIX, RECALC, and ONPRINTS (request for optional prints). The general form of the command is:

PREPARE [{WPNMOD / RECALC}]

[SETTING [game-parameter {EQUAL / =} : value]

[(attribute-1, attribute-2) {EQUAL / =} (value, value) [AND (value, value). . .]]]

[{FIXOFF / FIX} (DESIG [, DESIG] , GROUP [, {SALVO / ARRIVE}]) {EQUAL / =}

(desig [, desig] , value [, value])

[AND (desig [, desig] , value [, value]) . . .]]

[ONPRINTS number number, first-last number . . .]

2.2.2 The RECALC and WPNMOD Adverbs. The presence of the RECALC adverb causes the PREPALOC module to carryout the following functions:

- o Calculations and storage of geographic data

- Calculation of weapon overallocation data and salvo information
- Presetting of gaming parameters to defaults.

The WPNMOD adverb causes PREPALOC to accomplish only the second of the above three functions. This adverb can be used when weapon data has been modified but the geographic data has not.

Absence of the RECALC and WPNMOD adverbs will cause PREPALOC to bypass these functions. The user may wish to bypass these functions in order to save processing time if the PREPALOC module has already been employed. Fixed assignments normally have been entered after an execution of PREPALOC in the RECALC mode. Non-RECALC execution modes (with no intervening tape RESTOREs) simply adds data to the existing data base.

2.2.3 The SETTING Adverb. Two main sets of data are considered under this clause. The first permits the definition of variables that will finalize the game scenario being executed. The second allows the user to set attributes in various combinations of subsets whereby target value, MINKILL, MAXKILL or height-of-burst overrides previous inputs or calculations.

2.2.3.1 Gaming Parameters. The user has the capability to input values for parameters given in table 1. If inputs are absent, default values are used. Simply, values are entered as:

INITSTRK=1

For any given weapon group, weapons will be added for sortie generation constraint considerations. The number of weapons in each group will be

WEAPONS*(1.0 + PEX + (EXN/VEHICLES))

where WEAPONS and VEHICLES are PLANSET determined; PEX=PEXBOMB, PEXMISS, or PEXMIRV; and EXN=EXNBOMB, EXNMISS, or EXNMIRV.

2.2.3.2 Target Modifications. The target modification portion of the setting clause allows the user to change target value, minimum or maximum required destruction fraction, and height of burst on any target or set of targets. In the general command sentence given above, generic word attribute-1 refers to the identification of the target set over which a specific change is to be effective. Generic word attribute-2 refers to the attribute that is to be changed. Therefore:

attribute-1 = DESIG (designator code), TYPE (type name), CLASS (target class name), CNTRYL (target country location), or IREG (target region)

and

attribute-2 = VALUE (target value), MINKILL (minimum value destroyed), MAXKILL (maximum value destroyed), or IDHOB (target height of burst specification), 'AIR' or 'GROUND')

THIS PAGE INTENTIONALLY LEFT BLANK

Table 1. Game Related Parameters

MNEMONIC	DEFAULT	RANGE	DESCRIPTION
INITSTRK	1	1 or 2	Strike type (first or second). In the first strike case, the launch timing is determined by the other two input parameters. In the second strike case, all alert weapons launch after their specified alert delay (ALRTDL), all nonalert weapons launch after their nonalert delay (NLRTDL), and the detailed coordinated missile timing parameters in program PLANOUT are ignored.
CORMSL	0.0	0.0-1.0	Gross missile launch timing. Defined as the fraction of missile flight completed at time zero. A value of 0.0 specifies missile launch; a value of 1.0 specifies missile impact.
CORBOMB	0.0	≥0.0	Bomber launch timing. The number of nautical miles prior to the corridor entry that each bomber reaches at time zero.
PEXBOMB*	0.0	≥0.0	The fraction of bomber weapons added for each weapon group for over allocation.
EXNBOMB*	3.0	0.0-1000.0	Vehicle 'loads' added to each bomber group. A vehicle 'load' is the ratio of the number of weapons (PLANSET determined) to the number of vehicles
PEXMISS**	0.0	≥0.0	Same as PEXBOMB for non-MIRV missiles
EXNMISS**	0.0	0.0-1000.0	Same as EXNBOMB for non-MIRV missiles
PEXMIRV**	0.1	≥0.0	Same as PEXBOMB for MIRV missiles
EXNMIRV**	2.0	0.0-1000.0	Same as EXNBOMB for MIRV missiles

* These parameters are modified for bomber groups with less than 15 bombers.

** These variables must be such that the total number of vehibles per group (including overallocation) does not exceed 1030 for bombers and 1130 for missiles.

Any combination of target subsetting is permissable but there is a ranking order in the final storage of input values. The order of priority is: DESIG, TYPE, CLASS, CNTRYL, IREG. That is, if a given target is referenced by more than one output target set, the cited order applies.

Consider:

(TYPE,VALUE) = B52,10) (CNTRYL,VALUE) = (US,20) (CLASS,VALUE) = (MISSIL,10) (DESIG,VALUE) = (AB123,30)

In terms of the hierarchy, all targets located within the US will have a value of 20; all B52s and MISSILs will have a value of 10 (even if located within the US); and the individual target AB123 will have a value equal to 30.

If some targets within the given subset are components of a target complex, the planning factors for the complex would be changed to agree with the modified values for the components. If an attempt is made to modify the same planning factor for a complex target as a whole, and also on a component of that complex, the former change will be effected and the latter change will be ignored.

In the absence of a height-of-burst specification, the optimal height is used. When changing VALUE, the normalized VALUE should be entered.

In summary, then, this phrase of the SETTING clause is:

$$\underline{\text{PREPARE SETTING}}\ \left(\left\{ \begin{matrix} \underline{\text{DESIG}} \\ \underline{\text{TYPE}} \\ \underline{\text{CLASS}} \\ \underline{\text{CNTRYL}} \\ \underline{\text{IREG}} \end{matrix} \right\} , \left\{ \begin{matrix} \underline{\text{VALUE}} \\ \underline{\text{MINKILL}} \\ \underline{\text{MAXKILL}} \\ \underline{\text{IDHOB}} \end{matrix} \right\} \right) = (\underline{\text{value}}, \underline{\text{value}}) \ \ldots$$

A setting of IDHOB may also be used to preset height of burst for a weapon type (the attribute altered is WHOB).

2.2.4 The FIX Adverb. The optional fixed assignment clause specifies the allocation of weapons to specific targets. A fixed assignment of weapons from a specific group to a specific target is maintained by module ALOC, which optimizes the assignment of the nonfixed weapons. In addition, the delivery time (minutes relative to H-hour) of non-MIRV missile weapons may be specified. Also the salvo launch number may be user controlled. Any one command may not contain both the salvo number and arrival time, however. These direct commands are:

```
FIX (DESIG,GROUP) = (AB123,4)
    (DESIG,GROUP,ARRIVE) = (AD187,6,.5) AND (FA001,92,1)
    (DESIG,GROUP,SALVO) = (FE001,7,1)
```

The first command fixes a weapon from group 4 to target AB123, and downtime is dependent on the time of flight. The second command fixes weapons

from groups 6 and 92 to targets AD187 and FA001 with downtimes of .5 and 1, respectively. The third command fixes a weapon from group 7 to target FE001 and the weapon will be launched within the first salvo.

In many cases fixed assignments are made to sets of targets that have sequential DESIGs. In order to capture this often used option, it is permissible for the user to input a string of DESIGs for many targets thereby fixing one weapon group from the indicated weapon group on each target. This command is an expansion on the individual assignment command and is recognized by the appearance of the word DESIG entered twice and separated by a comma. For example:

```
FIX (DESIG,DESIG,GROUP,ARRIVE) = (AB127,AB227,5,1.0)
AND (AB228,AB230,6,1.0)
```

Group 5 will have weapons fixed assigned to all targets starting with DESIG AB127 and ending with DESIG AB227 (101 separate targets). The alpha-portions of these two DESIGs must be equal.

An additional capability is provided by the attribute NUMALOC. The user specifies that more than one weapon of the group named be assigned to the target (or targets) specified. For example:

```
FIX (DESIG, GROUP, NUMALOC) = (AB321, 7, 5)
```

Five weapons from group 7 are to be assigned to target AB321.

The following constraints apply:

- No weapons from a bomber group may be fixed on a target which has been allocated more than 30 weapons.
- No more than 30 weapons may be fixed on an undefended target (MISDEF=0).
- The number of weapons in any group is the maximum number of fixed assignments which may be made from that group.

2.2.5 The FIXOFF Adverb. The FIXOFF adverb is exactly the same as the FIX adverb in format. However, its use will cause the fixed weapon's DGZ to be offset from the specified DESIG by an amount determined by ALOCOUT.

2.2.6 The ONPRINTS Adverb. It is not necessary to generate all permissible prints for every PREPALOC execution. For this reason, the ONPRINTS adverb permits the selection of up to four separate print requests numbered 1, 2, 3, or 4. Print request number 1 supplies geographical related reports; request number 2 supplies weapon group related prints; request number 3 prints target data; request number 4 generates target data as modified by user inputs.

The proper print requests follows the ONPRINTS adverb. A series of numbers (in any order) separated by at least a single space turns on the print requests.

Options 3 and 4 produces prints concerning the available target list. If desired, the user may request a subset of targets to be printed by specifying the first and last target. This is possible through the use of special operators comma (,) and dash (-). After the number 3 or 4 the starting target number to be printed will follow the comma operator and the last target number to be printed will follow the dash operator. Consider the command:

ONPRINTS 2 3,10-1297 4,1000

Prints for option two will be generated; target data for target numbers between 10 and 1297 will be generated for option three; and target data for target numbers between 1000 and the maximum value will be generated for option four. If the comma operator is missing print begins with target number one.

2.3 Output

2.3.1 Standard Reports. Standard prints appear depending upon user employment of specific options. Gaming parameters (figure 3) appear if RECALC is specified and/or any parameter is changed via a SETTING clause. The target data summary (figure 4) also appears in the case of RECALC or changes. The fixed assignment summary (figure 5) appears if the input contains a FIX clause.

2.3.2 Optional Reports. Reports generated for print option one are given in figures 6 through 8; figure 13 for option two; figure 14 for option three; and figure 16 for option four.

2.3.3 Error Messages. All possible error messages produced for PREPALOC are explained in figure 17.

THIS PAGE INTENTIONALLY LEFT BLANK

WEAPON CHARACTERISTICS

GROUP ①	CORNUM ②	DISTAC ③
1	1	0.000
	2	0.000
	3	2931.083
	4	4763.809
	5	5187.943
	6	3516.968
	7	3843.813
2	1	0.000

HEADING	MEANING
①	Weapon group number
②	Penetration corridor number
③	The distance from the group centroid to the corridor entry (nautical miles)

Figure 13. Print Option 2: Weapon Group to Penetration Corridor Distance Print

TARGET INFORMATION PRINT

TGTNUMB 12 (1) NAME = MOSCOW (2) INDEX NO = 1234 (3) DESIG = AB123UR11 (4) TASK = 114 (5)

LAT = 45.2000 (7) LONG = 212.8000 (8)

INDYPEN = 4 (9) DISTEG = 213.0000 (10) DISTDG = 514.2000 (11) DISTDF = 317.2000 (12) IDHOB = GROUND (13)

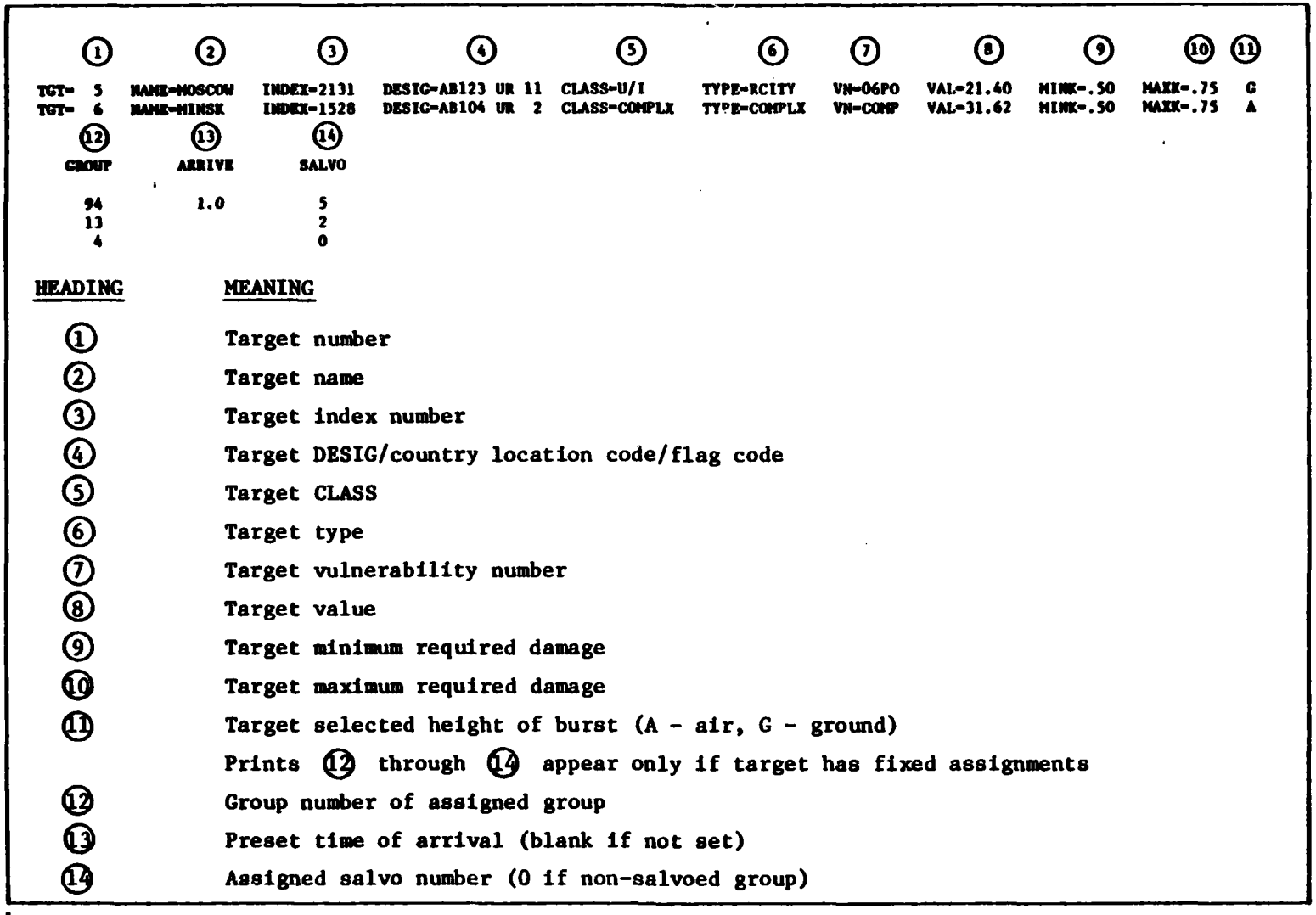
ICORR (14)	DISTCD (15)	ATTRCD (16)
1	0.0000	0.0000
2	0.0000	0.0000
3	201.4000	0.0005

HEADING	MEANING
(1)	Target number (assigned by PLANSET)
(2)	Target name
(3)	Target index number
(4)	Target DESIG/country location code/flag code
(5)	Target SIOP table number
(6)	Deleted field
(7)	Target latitude
(8)	Target longitude

Figure 14. Print Option 3: Target Information Print (Part 1 of 2)

HEADING	MEANING
⑨	Number of closest depenetration corridor
⑩	Length of depenetration corridor (nautical miles)
⑪	Distance from target to recovery base (nautical miles)
⑫	Distance from target to end of depenetration corridor
⑬	User selected height of burst for target
⑭	Penetration corridor number
⑮	Distance to corridor origin from target (nautical miles)
⑯	Attrition parameter, corridor origin to target (this value is used as the exponent in the attrition probability calculation)

Figure 14. (Part 2 of 2)



①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
TGT= 5	NAME=MOSCOW	INDEX=2131	DESIG=AB123 UR 11	CLASS=U/I	TYPE=RCITY	VN=06PO	VAL=21.40	MINK=.50	MAXK=.75	G
TGT= 6	NAME=MINSK	INDEX=1528	DESIG=AB104 UR 2	CLASS=COMPLX	TYPE=COMPLX	VN=COMP	VAL=31.62	MINK=.50	MAXK=.75	A

⑫ GROUP	⑬ ARRIVE	⑭ SALVO
94	1.0	5
13		2
4		0

HEADING	MEANING
①	Target number
②	Target name
③	Target index number
④	Target DESIG/country location code/flag code
⑤	Target CLASS
⑥	Target type
⑦	Target vulnerability number
⑧	Target value
⑨	Target minimum required damage
⑩	Target maximum required damage
⑪	Target selected height of burst (A - air, G - ground)
	Prints ⑫ through ⑭ appear only if target has fixed assignments
⑫	Group number of assigned group
⑬	Preset time of arrival (blank if not set)
⑭	Assigned salvo number (0 if non-salvoed group)

Figure 16. Print Option 4: Planning Factor Changes

- o **ONPRINTS** — User selects desired print option and specifies ranges and frequencies for those prints
- o **PUNCH** — User requests output of final Lagrange multipliers
- o **READMUL** — User specifies values for Lagrange multipliers to be used at the outset of ALOC execition
- o **RECALC** — User specifies that the Weapon Data File must be created by ALOC and not read in
- o **SETTING** — User specifies values for ALOC parameters other than their default values
- o **SMAT** — User specifies values for the SMAT array

The ALOC module will execute properly in the absence of any of these adverbs.

3.2.1 The FLAGREST Clause. This clause specifies interaction between weapon groups and the target attribute FLAG which may have a value of 0-9 inclusive. (A value of 0 indicates that no weapon is restricted from that target because of its flag.) In this clause, the user specifies which groups are restricted and what target FLAG values they may or may not attack. The general form of the FLAGREST clause is

$$\underline{\text{FLAGREST}} \quad \underline{\text{group}} \left[\text{, } \underline{\text{group}} \ldots \text{, } \underline{\text{group}} \right] \quad \left\{ \begin{matrix} \underline{\text{INCLUDE}} \\ \underline{\text{EXCLUDE}} \end{matrix} \right\}$$
$$\underline{\text{flag}} \left[\text{, } \underline{\text{flag}} \ldots \text{, } \underline{\text{flag}} \right]$$

The adverb may be followed by any number of sets of inputs each consisting of three parts. First a set of one or more group numbers separated by commas are supplied followed by either of the two special words: INCLUDE or EXCLUDE. Third a set of one or more flag numbers separated by commas define entries for attribute FLAG.

The relationship of the group numbers to the flag numbers is specified by the intervening special word. If the word is INCLUDE, then the specified groups are restricted from all but the specified flags. If the word is EXCLUDE, then the specified groups are restricted from the specified flags. For example

```
FLAGREST   1,2,3   INCLUDE   3,4   5,6   EXCLUDE   7,8
```

The result of this example would be that groups 1, 2, and 3 could not attack targets where FLAG values were 1, 2, 5, 6, 7, 8, or 9 and groups 5 and 6 could not attack targets where FLAG values were 7 or 8.

3.2.2 The LOCREST Clause. This clause specifies interaction between weapon groups and the country location code of targets. In this clause, the user specifies which groups are restricted and what target country

locations they may or may not attack. The general form of the LOCREST clause is:

LOCREST [, group . . . , group] {INCLUDE / EXCLUDE}

country location [, country location . . . , country location]

The adverb may be followed by any number of sets of inputs, each consisting of three parts. First a set of one or more group numbers separated by commas are supplied followed by either of the two special words: *INCLUDE or EXCLUDE. Third a set of one or more country location* codes (i.e., US, UR, etc.) separated by commas are entered.

The relationship of the groups to the country codes is specified by the intervening special word. If the word is INCLUDE, then the specified groups may not attack any targets but those with the specified country locations. If the word is EXCLUDE, the specified groups may attack only targets whose country locations are other than those given.

An example of a LOCREST clause:

LOCREST 1,2,3 INCLUDE UR,CH 4,5,6,7 EXCLUDE PO,CZ,BU

The result of *this example would be that groups* 1, 2, and 3 could only attack targets whose country location codes were "UR" or "CH", and groups 4, 5, 6, and 7 could not attack targets whose country codes were "PO", "CZ" or "BU".

3.2.3 The MINRANGE Clause. This clause allows the user to specify a value for the RNGMIN attribute other than that given for a group. The clause consists of a new minimum range value followed by one or more group numbers. Parantheses are optional. The general form is:

MINRANGE (minimum range , group [, group . . . , group])

As many sets of values may appear in a single clause as desired. The *user should note that use of this clause alters* the value of the RNGMIN attribute for this run of ALOC only and does not alter its data base value in any way. An example of a MINRANGE clause is:

MINRANGE (1000,1,2,3,4) (1500,9,10)

The result would be to set the RNGMIN value to 1000 for groups 1, 2, 3 and 4 and to 1500 for groups 9 and 10.

3.2.4 The MIRVREST Clause. This clause allows the user to specify restrictions for MIRV weapon types. These types may be restricted to particular target classes. In addition to standard classes, they may be restricted to complexes (COMPLE), defended complexes (COMPLD), and/or defended targets (DEFEND).

The general form of the MIRVREST clause is:

MIRVREST (payload name , class [, class . . . , class])

The adverb is followed by any number of sets of values separated by commas. The first value is the name of a MIRV group's payload table. The remaining values are class names of those targets which the indicated group(s) may attack. The parentheses are optional. An example follows.

MIRVREST (MM-III , COMPLE,COMPLD, U/I) (POSEID ,BOMBER)

This effect of this would be to restrict weapons with the payload table name "MM-III" to complexes (defended or not) and target class "U/I". Further weapons with the payload table name "POSEID" would only be able to attack single targets of class "BOMBER". Note: Although this option was designed for MIRV weapons, there is no current restriction which would prevent use of this option for non-MIRV weapon systems.

3.2.5 The MODRANGE Clause. This clause allows the user to decrease the data base attributes RANGE and RANGEREF for allocation purposes. The values of RANGE and RANGEREF initially stored within the data base are not altered. Module ALOC conducts the allocation with the user directed multipliers values but this information is not passed to other QUICK processors.

The user supplies multipliers for RANGE and RANGEREF on a weapon group basis. The general form is:

MODRANGE (range multiplier [/ refuel range multiplier]
, group [, group . . . , group])

The clause consists of any number of sets of values. The first value of the set is a multiplier for the RANGE attribute which is followed by the optional slash (/) and a multiplier for the RANGEREF attribute. Following the multipliers are the group numbers to which the multipliers are applicable. Each group number must be preceded by a comma. Numeric sets of multipliers may be defined by leaving at least one space between each data set.

If the multiplier for RANGEREF is omitted it is treated as the same as that for RANGE.

An example of a MODRANGE clause would be:

MODRANGE (.8/.9,1,2,3) (.7,4,5)

The effect would be to multiply the RANGE attribute by .8 and the RANGEREF attribute by .9 for groups 1,2 and 3. Also, both the RANGE and RANGEREF attributes of groups 4 and 5 would be multiplied by .7.

3.2.6 The ONPRINTS Clause. This clause allows the user to control the appearance of various print options. The options available are detailed in table 2. Each option may be selected and the frequency of its appearance(s) controlled as to the pass and/or targets. The control parameters available and their default settings are:

First pass of appearance - default pass 1.
Last pass of appearance - default pass 9999
First target of appearance- default target 1
Last target of appearance - default target 9999
Frequency of appearance as to target - default every target (1)

In addition, options 1, 2, 4 and 16 are initially selected with the frequency of option 4 set at 50. The user may request that these options not appear. The general form of the ONPRINTS clause is:

ONPRINTS option [, first target - last target / frequency]
[* first pass - last pass] [NOT option]

This clause has a number of optional forms. Following the adverb the user may input any number of sets of values in various forms. A single number (in the range 1-30, see table 2) will cause that option to appear with default controls. If the user wishes to suppress a default option (i.e., 1, 2, 4, or 16) the option number is preceded by the NOT operator.

User alterations to target control defaults are preceded by a comma. A number following the comma will be used as a first target control. A number preceded by a hyphen will be used as a last target and a number preceded by a slash will be used as a frequency. Only those controls which the user wishes to charge need be included. Similarly, the pass controls are preceded by an asterisk.

For example:

```
ONPRINTS   NOT 4   5,50*-2   6,/4
```

Would cause option 4 to be surpressed, option 5 to appear beginning with target 50 and for passes one and two, and option 6 to have a frequency of 4.

3.2.7 The PUNCH Clause. This adverb allows the user to request that the final Lagrange multiplier be saved on an output unit. The format used for this output is such that it can be assessed on later runs by the READMUL clause. The general form of the PUNCH clause is

PUNCH [NEW = unit number]

The optional portion is used to specify an output unit other than 43 (system punch).

Table 2. Description of Print Option Numbers for Program ALOC (Part 1 of 2)

OPTION	DESCRIPTION OF PRINT
1	Input weapon data
2	Main summary prints after weapons have been allocated to target
3	Not used
4	Print for all weapon groups the Lagrange multipliers, the total number of weapons allocated (RNALL), and number of weapons allocated this pass (NALL) with total weapon value and value of error in allocation
5	Print of data on target weights and rates of change of weights
6	Target input data before allocation begins
7	Basic weapon/target interaction data before allocation of weapons to target
8	Risk array before allocation begins on target
9	Summary of weapons assigned to present target and marginal values for each (see option 22 for companion print of potential weapons)
10	Input data to the single target allocator (STALL) -- i.e., output from WAD
11	Initial values for lambdas, VALWPNS and VALERR, at start of module only
12	Debugging print showing synopsis of calculation of actual payoff by WAD
13	Debugging print showing after-the-fact synopsis of potential weapon added and weapon deleted payoff calculations by WAD
14	Not used
15	Not used

Table 2. (Part 2 of 2)

OPTION	DESCRIPTION OF PRINT
16	Defense level and attack mode print for targets with terminal ballistic missile defense
17	Not used
18	Not used
19	Planning factor summary for targets with terminal ballistic missile defenses
20	Summary of WADOUT cost payoff benefit, etc.
21	Complete listing of allocation error estimates (ALLEREST)
22	Summary of marginal payoff data for potential weapons followed by resulting STALL decision: a companion print to print number 9
23	Printout of timing information
24	Memory dump and run termination
25	List of inactive switches for each weapon group as related to current target
26	Print of preferred corridors and computed penetration probabilities for each penetration corridor for all bomber groups relative to current target; available only on first pass
27	Best rate of return for missile allocation in DEFALOC
28	Debugging print of allocations and payoff computed in RESVAL
29	Print of Lagrange multiplier, balance parameter, and stockpile for salvoed missiles
30	Print of bomber payload indicators and allocation fractions

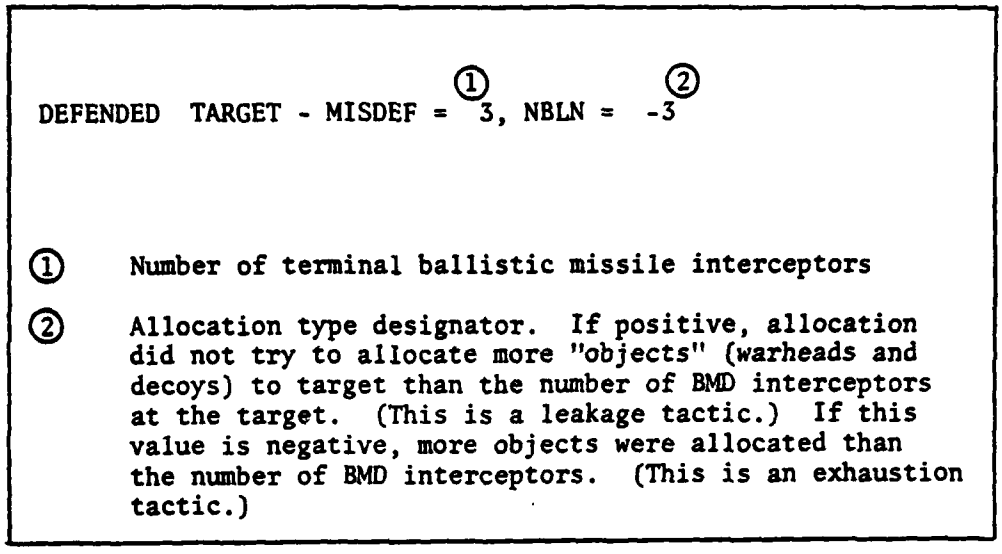
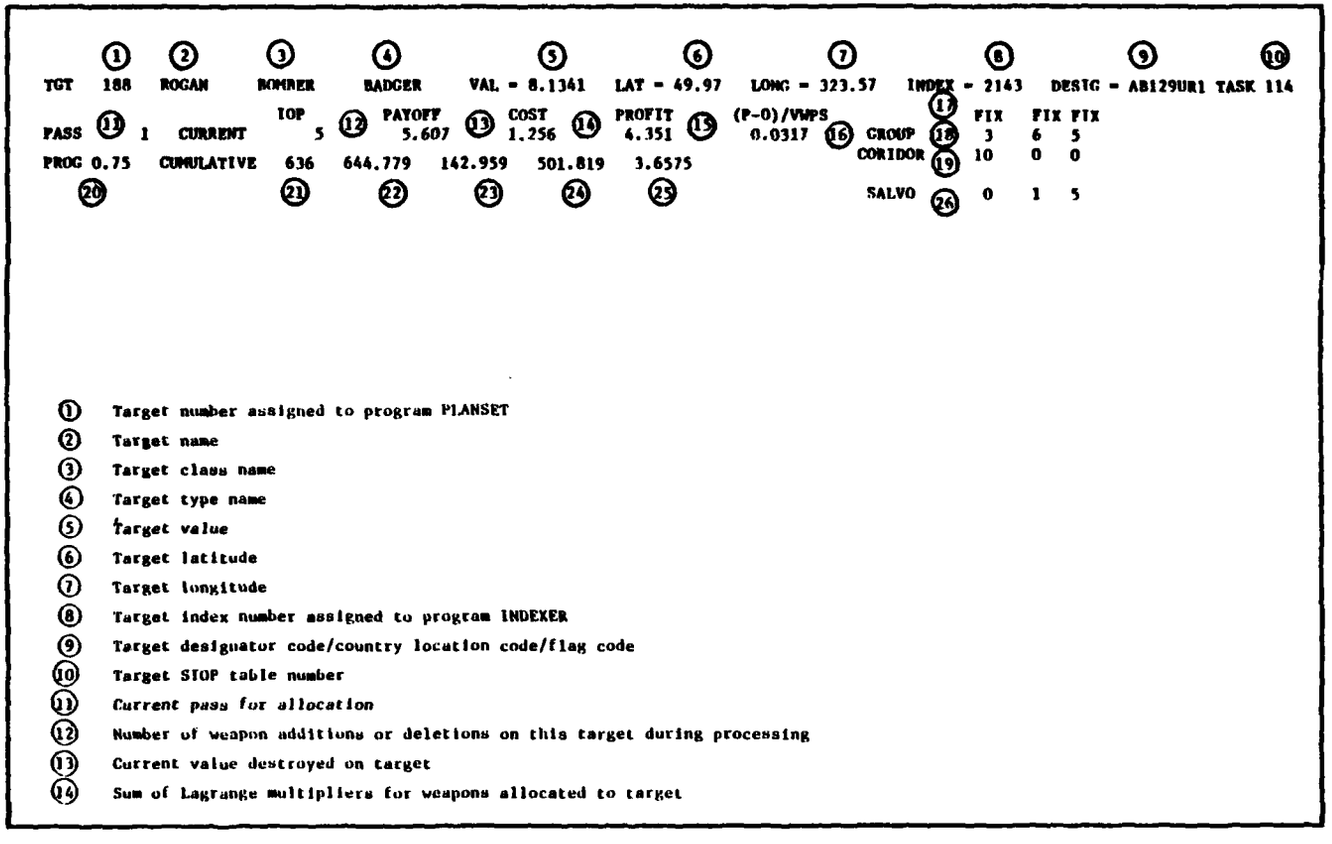


Figure 20. Defended Target Summary Print
(Print Option 16)



① Target number assigned to program PLANSET
② Target name
③ Target class name
④ Target type name
⑤ Target value
⑥ Target latitude
⑦ Target longitude
⑧ Target index number assigned to program INDEXER
⑨ Target designator code/country location code/flag code
⑩ Target SIOP table number
⑪ Current pass for allocation
⑫ Number of weapon additions or deletions on this target during processing
⑬ Current value destroyed on target
⑭ Sum of Lagrange multipliers for weapons allocated to target

Figure 21. Weapon Allocation Print (Print Option 2)
(Part 1 of 2)

(15) Difference of items 14 and 15

(16) Ratio of change of profit on this target to total value of all weapons

(17) Fixed Weapon Indicator: 'FIX'-weapon allocated by fixed assignment; blank-weapon allocated automatically

(18) Group numbers of weapons currently assigned to target

(19) Penetration corridor for weapon, unless negative; if negative, number of weapons for group assigned. If zero, weapon is a missile.

(20) Value of internal measure of progress

(21) Cumulative number of weapon addition and deletion operations

(22) Cumulative amount of value destroyed

(23) Cumulative sum of Lagrange multipliers for all weapons assigned

(24) Difference of items 24 and 25

(25) Sum of all ratios of profit to value of weapons

(26) Salvo number: 0 = nonsalvoed missiles; 0 = gravity bombs, 1 = ASMs (bombers)

Figure 21. (Part 2 of 2)

The quantity SDELTEFF therefore provides an estimate of how efficient the allocation would have been if the allocation had been terminated one pass earlier. Presumably, the current efficiency is substantially higher, but SDELTEFF does not, at this point, give any indication of how much. It is nevertheless of value in developing experience on how soon the PROGRESS .75 phase can be terminated. When PROGRESS is equal to 1.00 the multipliers are frozen, and this role of SDELTEFF ceases to be relevant. The quantity is then reset to zero. Thereafter it provides a measure of the effect on the profit of closing to the exact stockpile. Usually during the closing phase SDELTEFF goes slightly negative. However, since during this phase we continue to replace allocations originally produced with slightly different values of the multipliers, the value may go positive for a while until the closing forces get large enough to force closure even at some loss of profit. Thus the value of SDELTEFF at the end of the PROGRESS = 1.0 phase measures the loss of profit associated with closing. In the event that closing requires more than one full pass a test has been inserted which causes SDELTEFF to continue to accumulate over more than one pass when PROGRESS = 1.0.

Finally, when PROGRESS = 2.0 the quantity is again set equal to zero. If a verification pass is carried out, SDELTEFF then measures any increase in profit in the verification pass relative to the final allocation. In this role it defines an upper limit on the inefficiency of the actual allocation.

3.3.1.2.2 Summary Weapon Allocation Data. This print (print option 4) displays a summary of the weapon allocation. It always appears at the end of the weapon allocation process. If a verification pass is made, this print appears at the end of that pass. Figure 22 displays this print.

3.3.1.2.3 Timing Information for ALLOCATE Function. This print (option 23) displays the amount of time spent in processing the various phases of weapon allocation.

3.3.1.2.4 Termination of ALLOCATE Function. The ALLOCATE function will terminate normally on one of three conditions:

a. More than 1.5 passes while PROGRESS = 1.0

b. $|VALERR| < VALWPNS * ERRCLOS$, where VALERR is the absolute value of the sum of the Lagrange multipliers for all under- or over-allocated weapons, VALWPNS is the sum of the Lagrange multipliers for all weapons in the stockpile, and ERRCLOS is a user-input parameter for the ALLOCATE function.

c. $SUMSQERR < 1/(10*NTGTS^2)$ where NTGTS equals the number of targets and SUMSQERR equals the sum of the squares of the allocation error estimates.

①	② LAMBDA	③ NALL	④ RNALL	⑤ RNALL/NWPNS	VALWPNS=	⑥ 219.0084	VALERR=	⑦ 76.8694
1	0.571938	18	18	0.250				
2	0.272487	0	0	0.000				
3	0.571144	18	18	0.250				
4	0.272487	0	0	0.000				
5	0.621496	6	6	0.120				
6	0.622408	6	6	0.120				
7	0.618269	5	5	0.100				

HEADING	LABEL	DESCRIPTION
①		Weapon group index
②	LAMBDA	Value of Lagrange multiplier for group
③	NALL	Number of weapons of each weapon group that have been allocated since the start of the current pass
④	RNALL	Number of weapons of each weapon group that are currently allocated; considers all passes
⑤	RNALL/NWPNS	Ratio of the weapons allocated from each weapon group to the total number of weapons assigned to the group*
⑥	VALWPNS	Current value of all weapons
⑦	VALERR	Current value of the error in the allocation process

* 0 Indicates group contains no allocatable weapons (100% fixed)
-1 Indicates group contains allocatable weapons but none were selected - restrictions do not prevent allocation
-2 Indicates group restrictions (flag, country location, range, etc.) exclude group from all targets.

Figure 22. Weapon Allocation Summary Print (Print Option 4)

d. If convergence is unlikely, i.e., PROGRESS = 0.75 is not achieved by the end of PASS 3, the run will be terminated (see Error Messages, ALLOCATE Function, message 13).

When condition 1-3 occurs, the message "FINAL WEAPON ALLOCATION"* is printed followed by a print of options 2, 4, and 23. If the input parameter IVERIFY is nonzero, a verification pass is then made. At the end of the verification pass, or immediately following prints described above, the message "END OF WEAPON-TARGET PROCESSING" is printed, followed by a print of options 2, 4, and 23.

3.3.1.3 Detailed Prints. These prints are described according to their print option as follows.

a. Print Option 1 (Basic Weapon Group Information). This print is a standard print described in figure 19.

b. Print Option 2 (Weapon Allocation). This print is a standard print described in figure 21.

c. Print Option 4 (Weapon Allocation Summary). This print is a standard print described in figure 22.

d. Print Option 5 (Target Weight Information). This is a print of data on target weights and rates of change of weights. Figure 23 displays this print.

e. Print Option 6 (Basic Target Data). This print displays the basic target data prior to the allocation of weapons to the target. Figure 24 displays this print.

f. Print Option 7 (Weapon/Target Interaction Data). This print displays the basic weapon/target interaction data before weapon allocation. Figure 25 displays this print.

g. Print Options 8, 9, 10. These prints are debug prints described in the next section.

h. Print Option 11 (Initial Values of Lagrange Multipliers). This print, available only at the start of the ALLOCATE function, prints the initial values of the local Lagrange multipliers. Figure 26 displays this print.

i. Print Options 12 and 13. These prints are debug prints described in the next section.

j. Print Option 16 (Defended Target Summary). This print is a standard print described in figure 20.

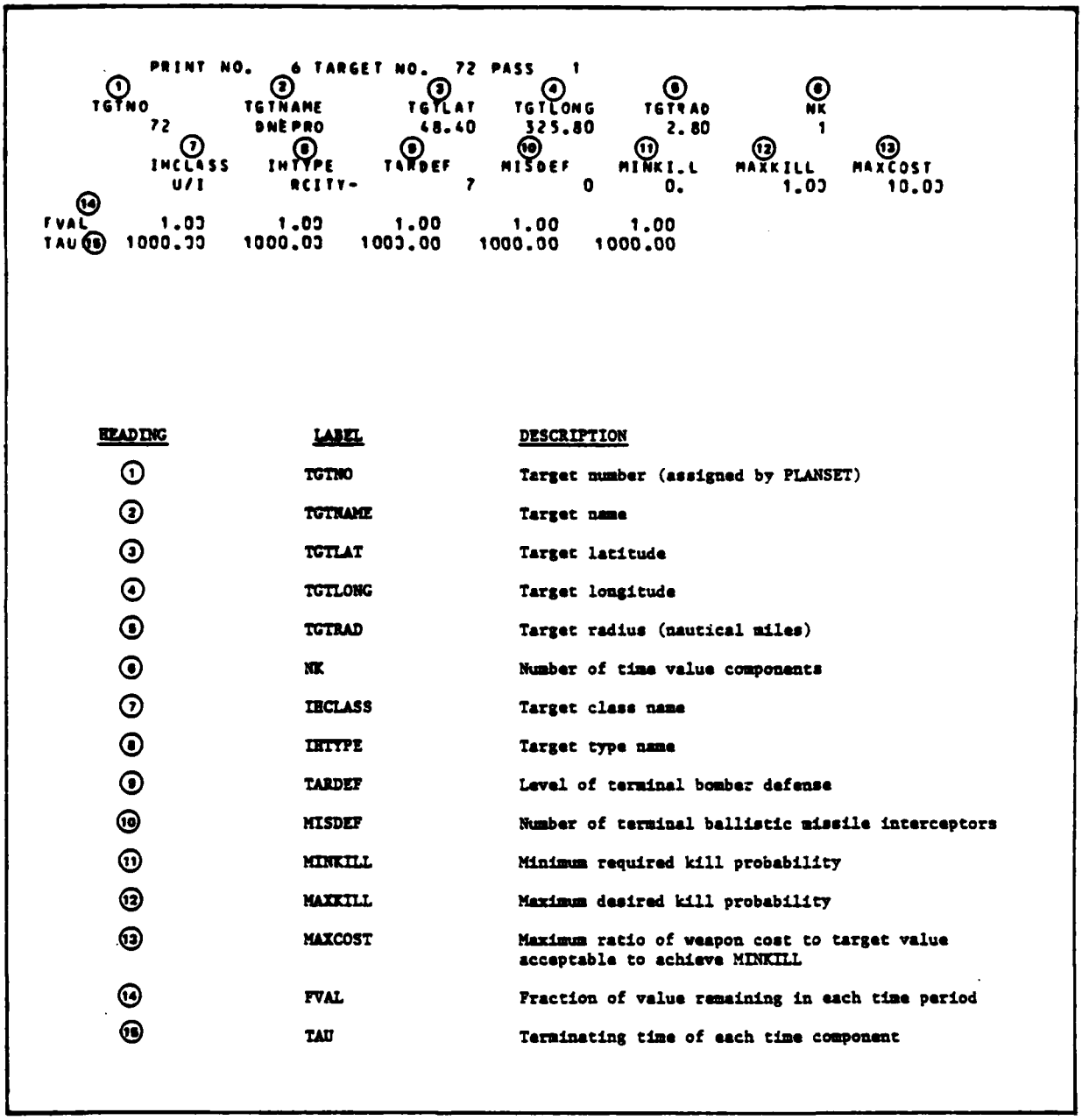
* For condition 4, the referenced error message is printed.

PRINT NO. 5

	① 1	② 2	③ 3
④ WTFAC	7.28011+000	7.28011+000	7.28011+000
⑤ WTRATE	1.00000+000	1.00000+000	1.00000+000
⑥ WTSUM	2.00786+002	2.00786+002	2.01287+002

HEADING	LABEL	DESCRIPTION
①	1	Column for first (shortest) integration period
②	2	Column for second integration period
③	3	Column for third (longest) integration period
④	WTFAC	Current running target weight in each integration period
⑤	WTRATE	Rate of increase of target weights in each integration period
⑥	WTSUM	Sum of target weights in each integration period

Figure 23. Print Option 5 - Target Weight Information



PRINT NO. 6 TARGET NO. 72 PASS 1

① TGTNO	② TGTNAME	③ TGTLAT	④ TGTLONG	⑤ TGTRAD	⑥ NK
72	BNEPRO	48.40	325.80	2.80	1

⑦ IHCLASS	⑧ IHTYPE	⑨ TARDEF	⑩ MISDEF	⑪ MINKILL	⑫ MAXKILL	⑬ MAXCOST
U/I	RCITY-	7	0	0.	1.00	10.00

⑭ FVAL	1.00	1.00	1.00	1.00	1.00
TAU ⑮	1000.00	1000.00	1000.00	1000.00	1000.00

HEADING	LABEL	DESCRIPTION
①	TGTNO	Target number (assigned by PLANSET)
②	TGTNAME	Target name
③	TGTLAT	Target latitude
④	TGTLONG	Target longitude
⑤	TGTRAD	Target radius (nautical miles)
⑥	NK	Number of time value components
⑦	IHCLASS	Target class name
⑧	IHTYPE	Target type name
⑨	TARDEF	Level of terminal bomber defense
⑩	MISDEF	Number of terminal ballistic missile interceptors
⑪	MINKILL	Minimum required kill probability
⑫	MAXKILL	Maximum desired kill probability
⑬	MAXCOST	Maximum ratio of weapon cost to target value acceptable to achieve MINKILL
⑭	FVAL	Fraction of value remaining in each time period
⑮	TAU	Terminating time of each time component

Figure 24. Print Option 6--Basic Target Data

PRINT NO. 8

③ RISK	① J=1	② A= 1	2	3	4	5	6	① J=2	② A= 1	2	3	4	5	6
1		0.00	0.04	0.04	0.11	0.05	0.00		0.00	0.04	0.04	0.11	0.05	0.00
2		0.00	0.19	0.19	0.72	0.20	0.00		0.00	0.19	0.19	0.72	0.20	0.00
3		0.00	0.04	0.04	0.11	0.05	0.00		0.00	0.04	0.04	0.11	0.05	0.00
4		0.00	0.19	0.19	0.72	0.20	0.00		0.00	0.19	0.19	0.72	0.20	0.00

HEADING	LABEL	DESCRIPTION
①	J	Index to hardness component
②	A	Attribute index (see table 8)
③	RISK	Group number

Figure 30. Print Option 8- - RISK Array Print

PRINT NO. 9 TARGET NO. 58 PASS 1

CURRENT STATE ① ITGT= 58 ② PASS= 1

③ TOTAL TARGET VALUE	④ RESIDUAL VALUE	⑤ COST	⑥ PROFIT
0.869	0.166	0.189	0.513

⑦ NUMBER WEAPONS ASSIGNED = 2

⑧ GROUP	⑨ ACT	⑩ MRG PAYOFF	⑪ MRG COST	⑫ MRG PROFIT	⑬ EFFICIENCY	⑭ BENEFIT	⑮ PVR/D.O	⑯ PP/DP	⑰ PREM/DPREM	⑱ SURPWP	⑲ PENX	⑳
6	D	0.119	0.368	0.051	1.759	0.132	0.	3.365	-0.013	65.814	1.000	0
4	D	0.323	0.121	0.202	2.668	0.343	0.	3.222	-0.020	52.797	1.000	7

HEADING	LABEL	DESCRIPTION
①	ITGT	Target number assigned by program PLANSET
②	PASS	Number of current pass
③	TOTAL TARGET VALUE	Original target value
④	RESIDUAL VALUE	Redisual target value after weapon deliveries
⑤	COST	Sum of Lagrange multipliers of assigned weapons
⑥	PROFIT	| ③-④-⑤ | Profit
⑦	---	Number of weapons assigned to target
⑧	GROUP	Group Number

Figure 31. Print Option 9--Marginal Value for Currently Allocated Weapons (Part 1 of 2)

(9)	ACT	Value of inactive flag
(10)	MRG PAYOFF	Marginal payoff for this weapon
(11)	MRG COST	Value of Lagrange multiplier for this weapon
(12)	MRG PROFIT	Marginal profit {(14) - (15)}
(13)	EFFICIENCY	Weapon efficiency {(16) / (15)}
(14)	BENEFIT	Profit including premium and damage constraints
(15)	PVR/0.0	= 0.0 (dummy variable)
(16)	PP/DP	Modified profit ((18) - (15))
(17)	PREM/DPREM	Premium for removing weapon
(18)	SURPWP	Estimated error in number of weapons used
(19)	PENX	Penetration probability
(20)	---	Preferred penetration corridor

Figure 31. (Part 2 of 2)

PROFIT = ① COST = ② TPMX = ③ ALPHA = ④ MINKILL = ⑤ MAXKILL = ⑥

MAXCOST = ⑦ PVRMX = ⑧ (⑨) PPMX = ⑩ (⑪) DPMN = ⑫ (⑬)

HEADING	LABEL	DESCRIPTION
①	PROFIT	Total profit on target
②	COST	Sum of Lagrange multipliers of weapons allocated this target
③	TPMX	Maximum profit considering damage constraints
④	ALPHA	Cost factor for damage constraints
⑤	MINKILL	Minimum desired kill probability
⑥	MAXKILL	Maximum desired kill probability
⑦	MAXCOST	Maximum value of weapon used to achieve MINKILL
⑧	PVRMX	Maximum value of modified efficiency, PVR
⑨	---	Group number which results in PVRMX, (IPVRMX)
⑩	PPMX	Maximum profit value for adding weapon
⑪	---	Group number which results in PPMX, (IPPMX)
⑫	DPMN	Maximum profit gained for deleting weapon
⑬	---	Group number which results in DPMN, (IDPMN)

Figure 32. Print Option 10--Weapon Profit and Efficiency Information

11 UNSATISFACTORY PROGRESS. RUN TERMINATED

After three full passes through the target list the value of PROGRESS is less than 0.75. The probability that the allocation process will converge to the correct stockpile at this point is very low. The job is therefore terminated. There are a large number of conditions which can cause this problem. A close check on the values of the target and planning factors should be made to see if the desired values are being used. If a run of this function with all default user input parameters does not remove this problem, consult a maintenance programmer.

12 FIXED ASSIGNMENT REQUEST NOT HONORED FOR GROUP (1) ON TARGET DESIG = (2) - INDEXNO = (3) - TARGET NO. = (4)
TARGET NO. = (4)
PROBLEM IS (5)

The user has requested a fixed assignment of a weapon from group (1) to a target with designator code (2) , index number (3) , and target number (4) . The request cannot be honored and the weapon is not allocated at all (to any target). The reason for not honoring the request is given in (5) . The reasons are as follows:

- CNTRYL -- Restriction by country code (LOCREST option)
- FLAG -- Restriction by flag code (FLAGREST option)
- MINRAN -- Restriction by minimum range (MINRANGE option)
- MIRV -- Restriction of MIRV weapons (MIRVREST option)
- NAVAL -- Restriction of weapons with PKNAV = 0 to targets to class NAVAL and vice versa
- PENETR -- Inadequate capability to penetrate to the target; if this message occurs for a missile, check attributes RADPX and PKTK.
- RANGE -- Inadequate range to reach the target (possibly RANGEMOD option)
- VALUE = 0 -- The target has zero value at the weapon time of arrival. (Data base entry or possibly VALUEMOD option of module PREPALOC.)

13 LOOP = (1)

In this message (1) is the total number of targets encountered so far on which more than 100 weapon addition or deletion operations (IOP) were required before subroutine STALL terminated the allocation process. Once this condition occurs, this message is printed as every succeeding target is processed. On each target with more than 100 weapon addition or deletion operations, the value of (1) is incremented by one. This message is for information only; no user action is required.

Figure 45. (Part 2 of 3)

14	TARGET (1) MINKILL REQUIRES TOO MANY WEAPONS On target with target number (1) , a target with terminal ballistic missile defenses, the required minimum target destruction probability cannot be achieved after an allocation of 40% of the total missile force that can reach this target. The program continues using the allocation of 40% of each missile group that can be allocated to this target. This message is for information only; no user action is required.
15	BOMBER FROM GROUP (1) CANNOT BE FIXED IN A MISSILE SATUFATION ATTACK ON TARGET (2) - INDEX = (3) TARGET (4) The user has fixed a bomber weapon from group (1) on a target where he has fixed more than 30 weapons. The only case where an excess of 30 weapons is allowed is a missile saturation attack on a target with terminal ballistic missile defenses. The fix request for this bomber weapon is ignored and processing proceeds. The target name is displayed as (2) ; the index number as (3) ; the target number as (4) .

Figure 45. (Part 3 of 3)

(1) CLASS	(2) TYPE	(3) NAME	(4) LATITUDE DEG MIN SEC	(5) LONGITUDE DEG MIN SEC	(6) TARGET CODE	(7) VALUE	(8) INDEXNO	(9) VALUE OF COMPLEX	(10) TGT NO	(11) VULN
[illegible]	[illegible]	[illegible]	56 49	0 306 47 59	AP630	1.8132	2511	[illegible]	1	[illegible]

(12) NUMBER	(13) SORTIE SEQUENCE	(14) HOB	(15) GROUP NUMBER	(16) CORRIDOR NUMBER	(17) SALVO NUMBER	(18) PTI	(19) ARRIVAL TIMES	(20) REAL EST DESTROYED	(21) VALUE DESTROYED	(22) LATITUDE DEG MIN SEC	(23) LONGITUDE DEG MIN SEC	(24) YIELD KILOTONS
1	5	A	6	0	12	1.0000	0.5711	27.9293	27.9293	56 46	0 306 47 59	100.00
2	2	A	2	0	12	1.0000	0.5719	46.0581	55.0581	56 46	0 306 47 59	100.00
3	3	A	1	7	1	0.9911	2.5456	81.9729	81.9729	56 46	0 306 47 59	1500.00
4	4	A	4	7	1	0.9695	2.5458	94.1243	94.1243	56 48	0 306 47 59	1000.00
5	1	A	5	7	0	0.9905	2.5451	94.9597	94.9597	56 46	0 306 47 59	1000.00

HEADING	LABEL	DESCRIPTION
(1)	CLASS	Target class name
(2)	TYPE	Target type name
(3)	NAME	Target name
(4) (5)	LATITUDE, LONGITUDE	Target latitude and longitude in degrees, minutes, seconds
(6)	TARGET CODE	Target designator code
(7)	VALUE	Total target value
(8)	INDEXNO	Target index number; for complex target, first target ** appended to its index numbers; subsequent targets in the complex *
(9)	VALUE OF COMPLEX	Total value of complex of which target is part
(10)	TGT NO	Internal (program) target number
(11)	VULNERABILITY CODE	The code describing the targets vulnerability
(12)	NUMBER	Internal index number for weapon allocated to the target
(13)	SORTIE SEQUENCE	Sortie Sequence number
(14)	HEIGHT OF BURST	G-ground burst A-air burst

Figure 52. Sample Target List (Part 1 of 2)

HEADING	LABEL	DESCRIPTION
(15)	GROUP NUMBER	Weapon group number
(16)	CORRIDOR NUMBER	0 for missiles; penetration corridor number for bombers
(17)	SALVO NUMBER	Salvo number (zero for nonsalvoed missiles) for bombers, zero for gravity bombs; one for ASM
(18)	PTP	Weapon penetration probability
(19)	ARRIVAL TIMES	Weapon arrival time at target
(20)	REAL EST DESTRYED	Target value destroyed if that value was not time dependent
(21)	VALUE DESTRYED	Calculated target value destroyed
(22) (23)	LATITUDE, LONGITUDE	Calculated latitude and longitude of weapon burst (zero when EVALALOC run after ALOC)
(24)	YIELD	Yield of weapon in kilotons

Figure 52. (Part 2 of 2)

THIS PAGE INTENTIONALLY LEFT BLANK

1	(I3) IS AN ILLEGAL ADVERB NUMBER FOR EVALUATE -- IT WAS THE (I3)(A2) ADVERB The indicated adverb is not legal.
2	(I5) IS NOT THE VERB FOR EVALUATE -- CHECK COP Module EVALALOC executed with the incorrect verb.
3	UNEXPECTED FUNCTION CODE OF (A6) FOR (A6) FUNCTION ASSUMED TO BE (A6) An unknown function code was encountered. Check data base entries.
4	ONPRINTS NOT FOLLOWED BY A NUMBER -- NO SAMPLE TARGETS WILL BE PRINTED The print adverb does not specify how many targets are to be printed.
5	SETTING CLAUSE CONTAINS A NON-ATTRIBUTE (I5) (8013) Check spelling in SETTING clause.
6	ATTRIBUTE NOT BEING SET TO A CONSTANT The SETTING clause is restricted to setting the value of an attribute to a specific value.
7	END OF PHRASE BUT CANNOT FIND MARKER OR CONNECTOR Check text English syntax.
8	COUNTRIES NOT FOLLOWED BY INCLUDE EXCLUDE (012) (I5) ASSUMING INCLUDE Check for spelling of include/exclude.
9	COUNTRY CODE NOT FOLLOWED BY COMMA OR END OF CLAUSE ((2013) (I5)) Country codes must be separated by a comma. Check for a country code which is a COP special word or null.
10	TARGET TYPE NOT FOUND IN TGTMODIF Check target type spelling in TGTMODIF clause.

Figure 53. EVALALOC Error Messages (Part 1 of 3)

SECTION 5. MODULE ALOCOUT

5.1 General Purpose

Module ALOCOUT selects optimal aim point offsets for weapons allocated to complex targets and reorders the weapon group assignment chains for use within the Sortie Generation subsystems. For missile groups, the sort in according to salvo number and within salvo, according to attribute RVAL. For bomber groups the new order is a collection of strikes belonging to the penetration corridor that has the largest number of assignments followed by strikes of the penetration corridor that has the next largest number of assignments and so on. Within each collection of strikes belonging to the same penetration corridor, the assignments are further sorted based on attribute RVAL. The user should note that if attribute ATTPOS $\neq$ 0, only those weapon groups where ATTINC = ATTPOS are reordered.

5.2 Input

The only options available to the user in module ALOCOUT are to specify the type and frequency of the various prints and/or to specify the maximum number of iterations to be executed by the generalized function minimizes which is used to select the aim point offsets for those weapons assigned to complex targets. The general command is:

DGZSELECT [ONPRINTS option option . . .]
[FINDMIN imax]

5.2.1 The ONPRINTS Adverb. This adverb selects various print or calculation options. It recognizes any series of numbers (each number separated by at least one blank) with values varying from one to nine. The presence of any of the numbers within the clause selects the corresponding option which are:

- 1 -- Selects the detailed target print. For this option only a print frequency may be selected. This is entered by placing a slash (/) after the number one followed by the numeric value of the desired print frequency. An entry of 1/10 will print every ten targets. The default entry (1 by itself) prints all targets
- 2 -- Selects the bomber weapon group summary print
- 3 -- Selects the missile weapon group summary print
- 4 -- If entered offsets are not calculated
- 5 -- Selects the target data input to subroutine DGZSEL print
- 6 -- Selects the DGZSEL computational value print

- 7 -- Selects the DGZSEL improvement print
- 8 -- Selects maintenance prints
- 9 -- Selects timing information print

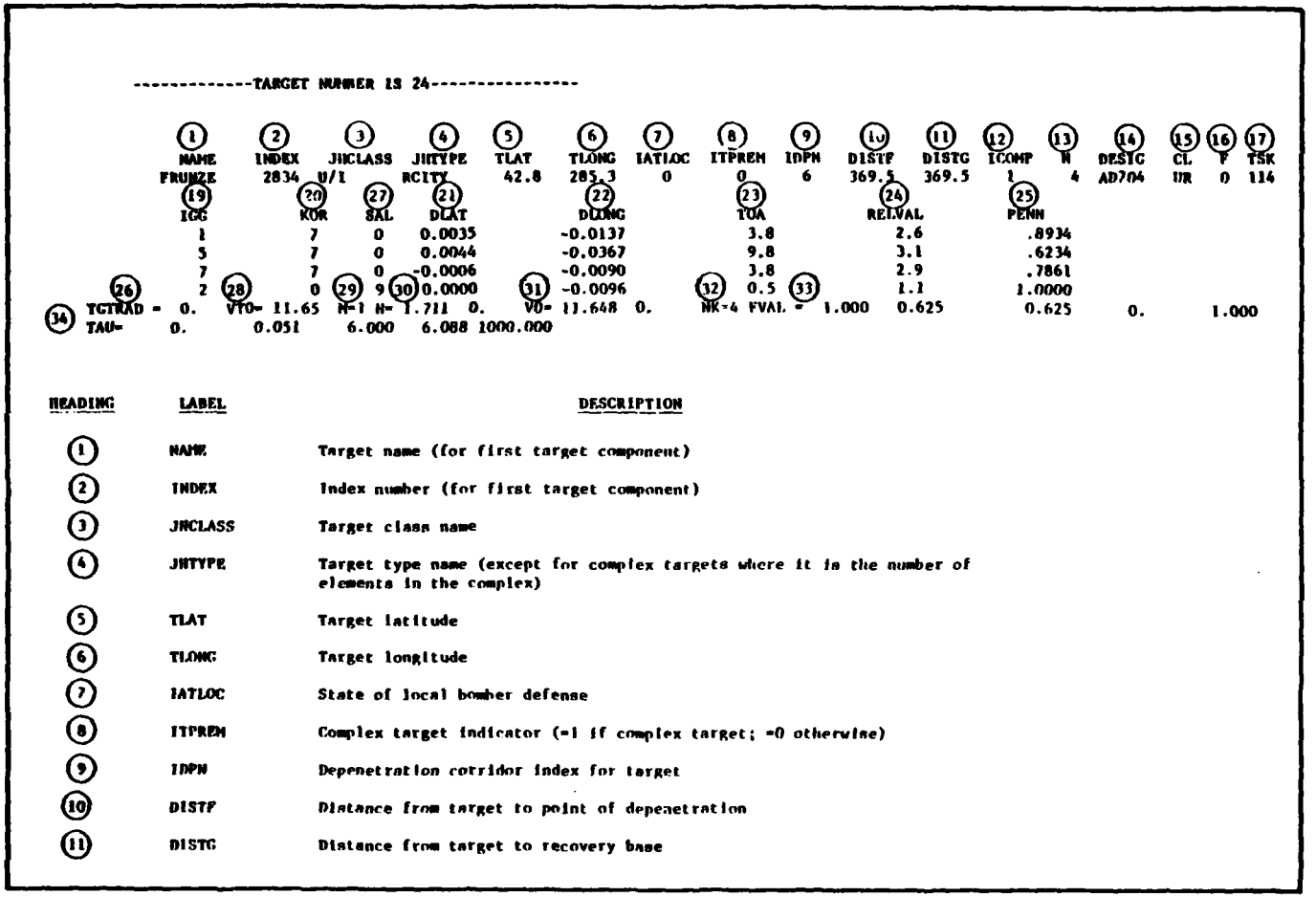
5.2.2 The FINDMIN Adverb. If absent the FINDMIN subroutine is not used. If present the FINDMIN subroutine is used and parameter 'imax' is set to the maximum number of iterations.

5.3 Output

5.3.1 Standard Output. All output is optional and must be selected by the user.

5.3.2 Nonstandard Output. Figures 57 to 60 presents the output for print options available to the user within the ONPRINTS clause.

5.3.3 ALOCOUT Error Messages. The error messages for ALOCOUT are shown in figure 61.



----------TARGET NUMBER IS 24----------

(1) NAME	(2) INDEX	(3) JHCLASS	(4) JHTYPE	(5) TLAT	(6) TLONG	(7) IATLOC	(8) ITPREM	(9) IDPN	(10) DISTF	(11) DISTG	(12) ICOMP	(13) N	(14) DESTG	(15) CL	(16) F	(17) TSK
FRUNZE	2834	U/I	RCITY	42.8	285.3	0	0	6	369.5	369.5	1	4	AD704	UR	0	114

(19) ICG	(20) KOR	(27) SAL	(21) DLAT	(22) DLONG	(23) TOA	(24) RELVAL	(25) PENN
1	7	0	0.0035	-0.0137	3.8	2.6	.8934
5	7	0	0.0044	-0.0367	9.8	3.1	.6234
7	7	0	-0.0006	-0.0090	3.8	2.9	.7861
(26) 2	(28) 0	(29) 9	(30) 0.0000	(31) -0.0096	(32) 0.5	(33) 1.1	1.0000

(34) TGTRAD = 0. VTO= 11.65 M=1 N= 1.711 0. VO= 11.648 0. NK=4 FVAL = 1.000 0.625 0.625 0. 1.000

TAU= 0. 0.051 6.000 6.088 1000.000

HEADING	LABEL	DESCRIPTION
(1)	NAME	Target name (for first target component)
(2)	INDEX	Index number (for first target component)
(3)	JHCLASS	Target class name
(4)	JHTYPE	Target type name (except for complex targets where it is the number of elements in the complex)
(5)	TLAT	Target latitude
(6)	TLONG	Target longitude
(7)	IATLOC	State of local bomber defense
(8)	ITPREM	Complex target indicator (=1 if complex target; =0 otherwise)
(9)	IDPN	Depenetration corridor index for target
(10)	DISTF	Distance from target to point of depenetration
(11)	DISTG	Distance from target to recovery base

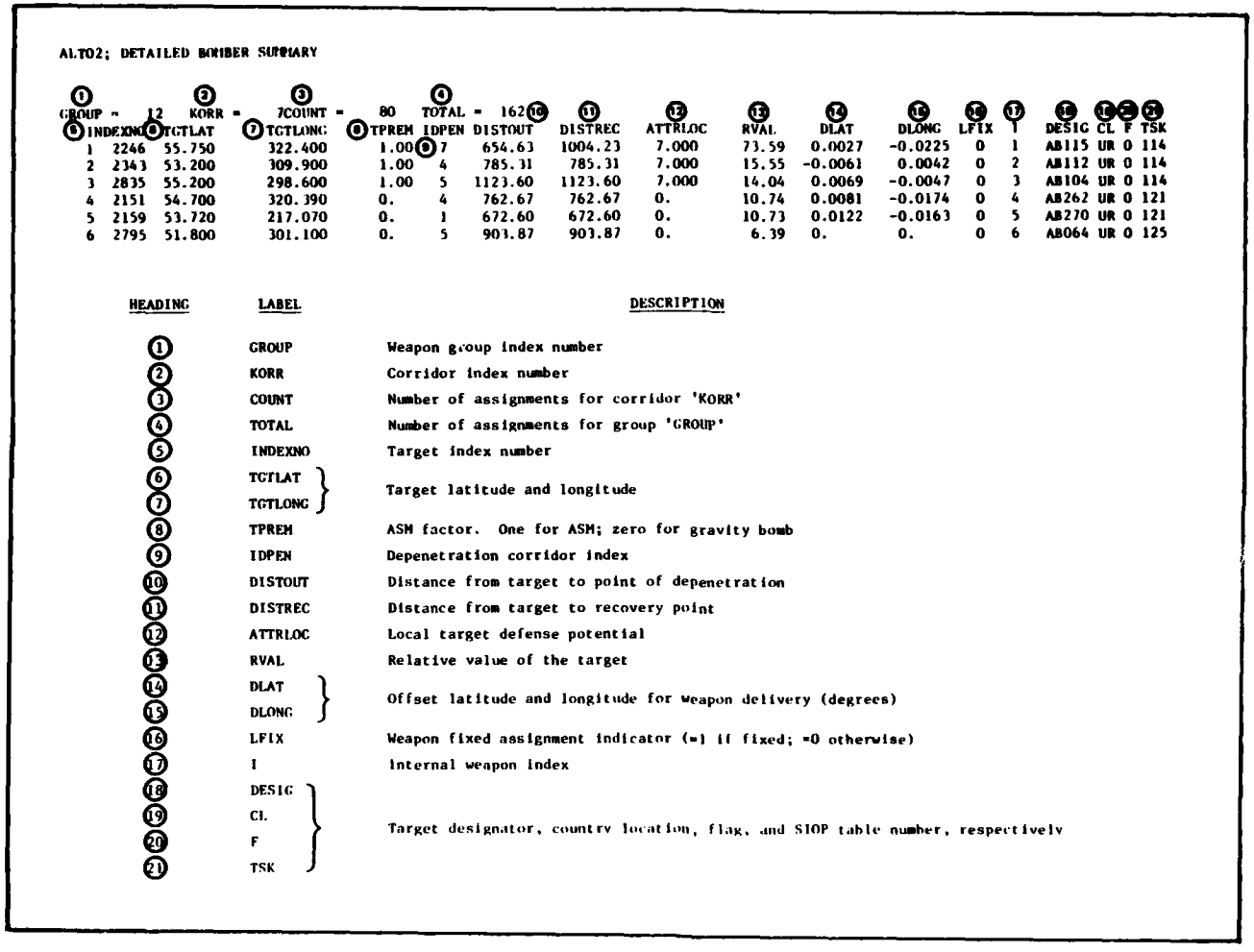
Figure 54. Print Option 1: Detailed Target Print (Part 1 of 3)

READING	LABEL	DESCRIPTION
(12)	ICOMP	Target type for complex target, and 0 otherwise
(13)	N	Number of weapons allocated to target
(14)	DESIG	Target designator, country location, and flag and SIOP table number respectively
(15)	CL	
(16)	F	
(17)	TSK	
(19)	IGG	Group number of weapon allocated to the target
(20)	KOR	Weapon penetration corridor or, in case weapons are missiles, the number of missiles from the group assigned to the target
(21)	DLAT	Offset latitude and longitude, respectively, for weapon delivery
(22)	DLONG	
(23)	TOA	Time of arrival for weapon delivery; -100 if fixed
(24)	RELVAL	Relative value of weapon allocation divided by weapon penetration probability
(25)	PEN	Weapon penetration probability
(26)	TGTRAD	Target radius

Figure 54. (Part 2 of 3)

HEADING	LABEL	DESCRIPTION
(27)	SAL	Salvo number (zero for non-salvoed missiles). For bombers, zero for gravity bomb, one for ASM
(28)	VTO	Original target value
(29)	M	Number of hardness components
(30)	H	Lethal radius for both hardness components
(31)	VO	Target value for both hardness components
(32)	NK	Number of time sensitivity points
(33)	FVAL	Fraction of target value at each time point
(34)	TAU	Time sensitivity points

Figure 54. (Part 3 of 3)



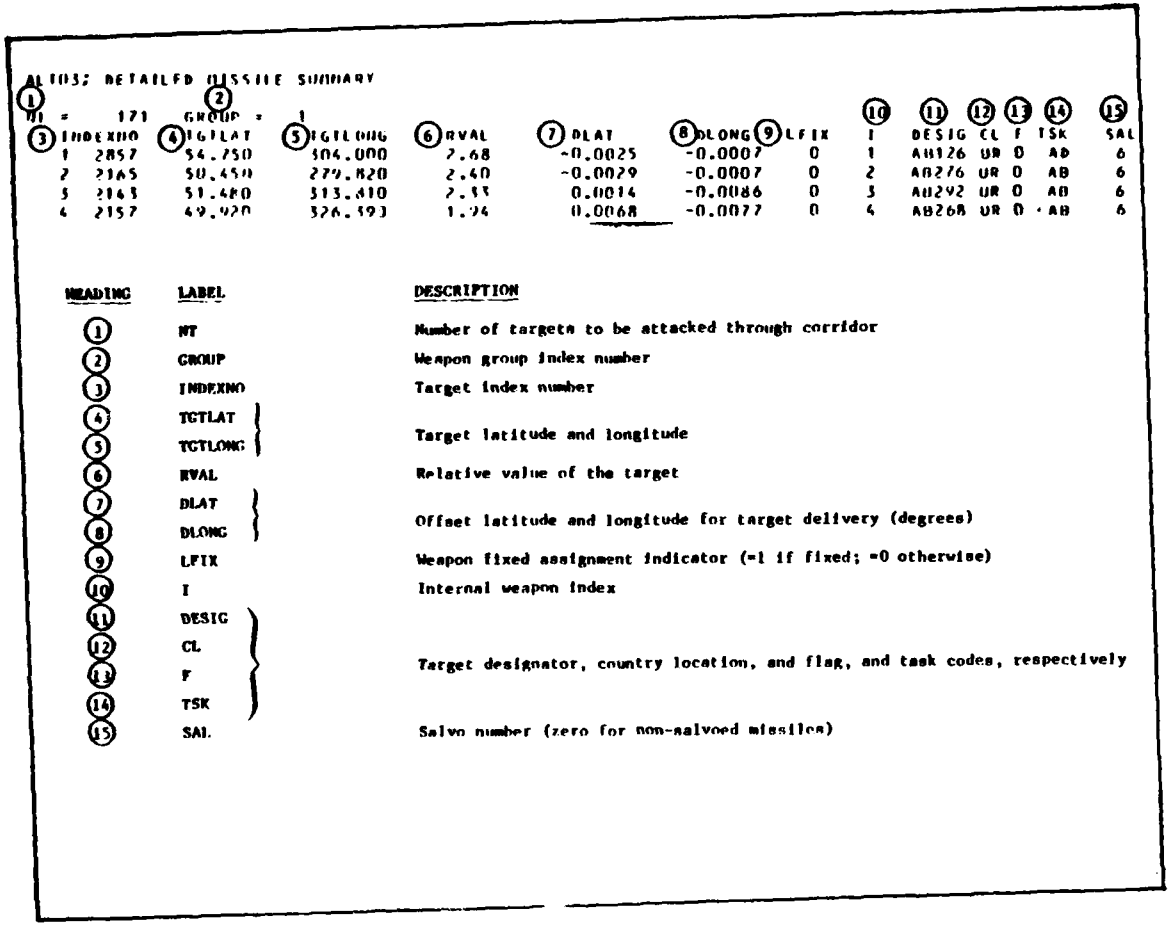
ALTO2; DETAILED BOMBER SUMMARY

GROUP = 12 KORR = 7 COUNT = 80 TOTAL = 162

INDEXNO	TGTLAT	TGTLONG	TPREM	IDPEN	DISTOUT	DISTREC	ATTRLOC	RVAL	DLAT	DLONG	LFIX	I	DESIG	CL	F	TSK
1	2246	55.750	322.400	1.00	7	654.63	1004.23	7.000	73.59	0.0027	-0.0225	0	1	AB115	UR	0	114
2	2343	53.200	309.900	1.00	4	785.31	785.31	7.000	15.55	-0.0061	0.0042	0	2	AB112	UR	0	114
3	2835	55.200	298.600	1.00	5	1123.60	1123.60	7.000	14.04	0.0069	-0.0047	0	3	AB104	UR	0	114
4	2151	54.700	320.390	0.	4	762.67	762.67	0.	10.74	0.0081	-0.0174	0	4	AB262	UR	0	121
5	2159	53.720	217.070	0.	1	672.60	672.60	0.	10.73	0.0122	-0.0163	0	5	AB270	UR	0	121
6	2795	51.800	301.100	0.	5	903.87	903.87	0.	6.39	0.	0.	0	6	AB064	UR	0	125

HEADING	LABEL	DESCRIPTION
1	GROUP	Weapon group index number
2	KORR	Corridor index number
3	COUNT	Number of assignments for corridor 'KORR'
4	TOTAL	Number of assignments for group 'GROUP'
5	INDEXNO	Target index number
6	TGTLAT	Target latitude and longitude
7	TGTLONG	
8	TPREM	ASM factor. One for ASM; zero for gravity bomb
9	IDPEN	Depenetration corridor index
10	DISTOUT	Distance from target to point of depenetration
11	DISTREC	Distance from target to recovery point
12	ATTRLOC	Local target defense potential
13	RVAL	Relative value of the target
14	DLAT	Offset latitude and longitude for weapon delivery (degrees)
15	DLONG	
16	LFIX	Weapon fixed assignment indicator (=1 if fixed; =0 otherwise)
17	I	Internal weapon index
18	DESIG	Target designator, country location, flag, and SIOP table number, respectively
19	CL	
20	F	
21	TSK	

Figure 55. Print Option 2: Detailed Bomber Summary



ALT03: DETAILED MISSILE SUMMARY

(1) NT = 171 (2) GROUP = 1

(3) INDEXNO	(4) TGTLAT	(5) TGTLONG	(6) RVAL	(7) DLAT	(8) DLONG	(9) LFIX	(10) I	(11) DESIG	(12) CL	(13) F	(14) TSK	(15) SAL
1 2857	54.750	304.000	2.68	-0.0025	-0.0007	0	1	AW126	UR	0	AB	6
2 2145	50.450	279.820	2.40	-0.0029	-0.0007	0	2	AB276	UR	0	AB	6
3 2143	51.480	313.410	2.33	0.0014	-0.0086	0	3	AW292	UR	0	AB	6
4 2157	49.920	326.593	1.94	0.0068	-0.0077	0	4	AB268	UR	0	AB	6

HEADING	LABEL	DESCRIPTION
(1)	NT	Number of targets to be attacked through corridor
(2)	GROUP	Weapon group index number
(3)	INDEXNO	Target index number
(4)	TGTLAT	Target latitude and longitude
(5)	TGTLONG	
(6)	RVAL	Relative value of the target
(7)	DLAT	Offset latitude and longitude for target delivery (degrees)
(8)	DLONG	
(9)	LFIX	Weapon fixed assignment indicator (=1 if fixed; =0 otherwise)
(10)	I	Internal weapon index
(11)	DESIG	Target designator, country location, and flag, and task codes, respectively
(12)	CL	
(13)	F	
(14)	TSK	
(15)	SAL	Salvo number (zero for non-salvoed missiles)

Figure 56. Print Option 2: Detailed Missile Summary

TGT DATA INPUT TO DGZSEL

TGTEL ①	1	2	3	4
XO ②	0.745818	-0.902489	0.110597	1.403162
YO ③	-0.881090	-0.123431	0.534948	2.004138
RADL ④	2.829217	2.829217	2.829217	2.829217
VI ⑤	0.137391	0.137391	0.137391	0.137391
VTOA(,1) ⑥	0.137391	0.137391	0.137391	0.137391
VTOA(,2)	0.137391	0.137391	0.137391	0.137391
VTOA(,3)	0.137391	0.137391	0.137391	0.137391
VTOA(,4)	0.137391	0.137391	0.137391	0.137391
VTOA(,5)	0.137391	0.137391	0.137391	0.137391

⑦ WPN	⑧ PDEL	⑨ ERDFL	⑩ YDSCL
1	0.810000	1.000000	1.012909
2	0.719597	0.500000	1.233106
3	0.718460	0.500000	1.235592
4	0.139694	0.500000	1.216440
5	0.150915	0.500000	1.228670

HEADING	LABEL	DESCRIPTION
①	TGTEL	Target element number ($J \leq 7$)
②, ③	XO(J), YO(J)	E-W and N-S displacements, respectively, of target element J in nautical miles
④	RADL(J)	One-megaton lethal radius for target element J
⑤	VI(J)	Initial value of target element J
⑥	VTOA(J,I)	Value of target element J immediately after the arrival of weapon I
⑦	WPN	Internal weapon index (I)
⑧	PDEL(I)	Delivery probability for the Ith weapon
⑨	ERDEL(I)	CEP for weapon I
⑩	YDSCL(I)	Scaled weapon yield $= \left[\text{(actual yield)}\right]^{1/3}$

Figure 57. Print Option 5: Target Data Input to DGZSEL Debug Print

DGZSEL COMPUTATION VALUES

① WPN	② X	③ Y	④ S1	⑤ S2	⑥ S3	⑦ S4	⑧ S5
1	0.118597	0.534948	0.482132	0.436289	0.348630	0.951396	
2	0.118597	0.534948	0.425455	0.384884	0.308798	0.488238	
3	0.118597	0.534948	0.425842	0.385402	0.309781	0.488373	
4	0.118597	0.534948	0.884130	0.881070	0.865964	0.901547	
5	0.118597	0.534948	0.879694	0.871121	0.855081	0.892927	

⑨ TOTAL ESCAPED TARGET VALUE= 0.034145

HEADING	LABEL	DESCRIPTION
①	WPN	Internal weapon index
②	X(I)	Offset aim coordinates for weapon (in nautical miles)
③	Y(I)	Offset aim coordinates for weapon (in nautical miles)
④ ↓ ⑧	S1 ↓ S5	Survival probability of target element J relative to weapon I (J = 1,5)
⑨	VESCTOT	Total escaped target value

Figure 58. Print Option 6: DGZSEL Computation Values Debug Print

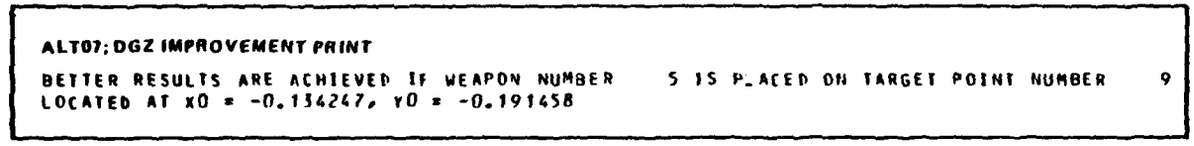
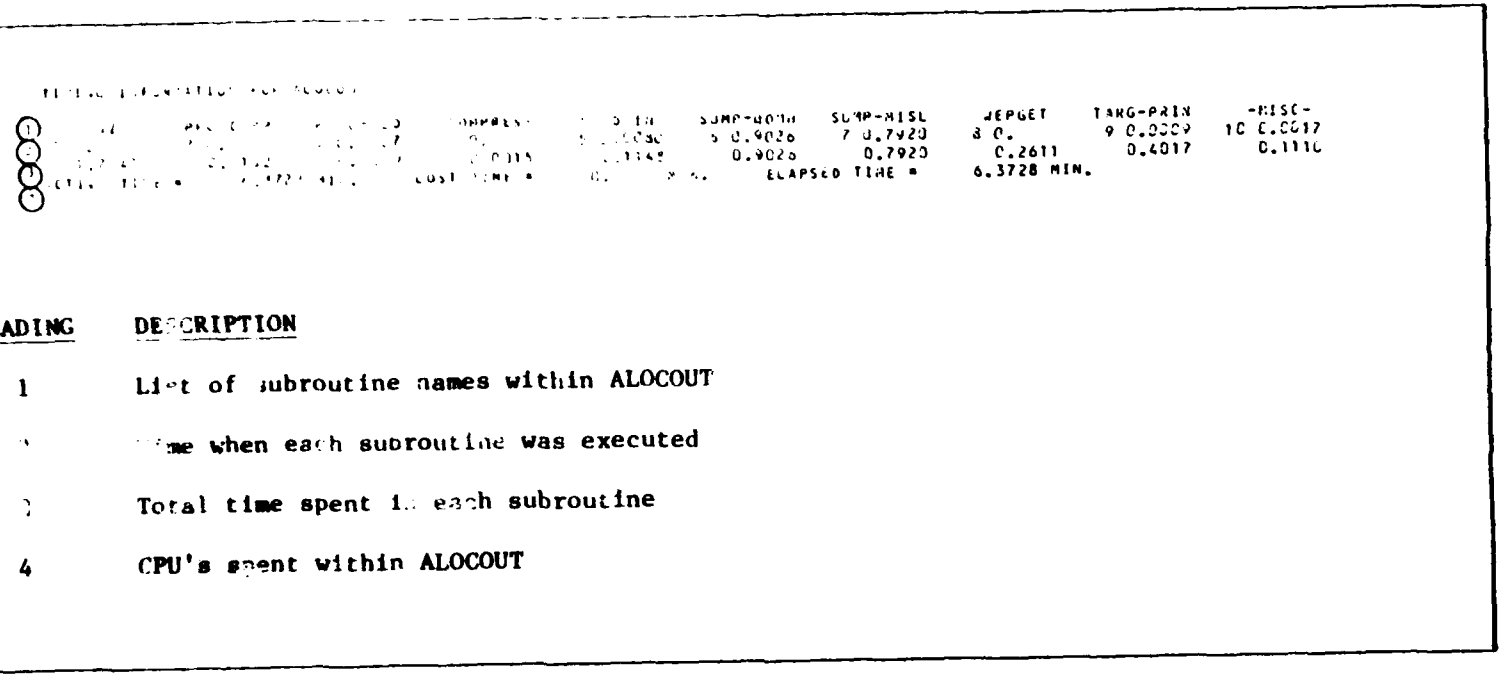


Figure 59. Print Option 7: DGZ Improvement Print



HEADING	DESCRIPTION
1	List of subroutine names within ALOCOUT
2	Time when each subroutine was executed
3	Total time spent in each subroutine
4	CPU's spent within ALOCOUT

Figure 60. Print Option 9: ALOCOUT Timing Print

1	MODULE ALOCOUT CANNOT DETERMINE ADVERB (012) Check for correct spelling within the command.
2	ERROR IN ONPRINTS CLAUSE Check for proper syntax within ONPRINTS clause.
3	*** ERROR--NFIX = _ _ _ _ _ _ NFIX, the number of weapons allocated through the fixed assignment capability, is negative; the run is aborted.
4	*** _ _ _ _ _ _ _ _ *** ABANDON DGZSEL ON COMPLEX TARGET NAME INDEX COMPONENT TGTNAME INDEXNO *** _ _ _ _ _ _ _ _ *** Subroutine COMPRESS has been entered with open tolerances more than 50 times in succession so no further attempt to use DGZSEL is made for this target.
5	*** TOLERANCES OPENED N TIMES IN SUBROUTINE COMPRESS TO REDUCE NUMBER OF TARGET POINTS TO 250. TARGET NAME INDEX NUMBER INDEX COMPRESS opened tolerances N times to reduce number of target elements. NAME is the target name. INDEX is the target index number. This is a message produced by subroutine COMPRESS, but is not an error message.
6	ALOCOUT PROCESSING COMPLETED ON IW WEAPONS IT TARGETS Statement of number of weapons and targets processed by ALOCOUT, where number of targets is the sum of the numbers of simple and complex targets and multiple target elements, which were assigned weapons.
7	BAD CALL ON ERGOT More than 10 serires are being run in parallel; control is returned to the calling subprogram without computing ERGOT1.

Figure 61. ALOCOUT Error Messages

DISTRIBUTION

Addressee	Copies
CCTC Codes	
C124 (Reference and Record Set)	3
C124 (Stock)	6
C126	2
C313	1
C314	7
C630	1
DCA Code	
205	1
EXTERNAL	
Chief, Studies, Analysis and Gaming Agency, OJCS ATTN: SFD, Room 1D935, Pentagon, Washington, DC 20301	2
Chief of Naval Operations, ATTN: OP-654C, Room BE781 Pentagon, Washington, DC 20350	2
Commander-in-Chief, North American Air Defense Command ATTN: NPXYA, Ent Air Force Base, CO 80912	2
U.S. Air Force Weapons Laboratory (AFSC) ATTN: AFWL/SUL (Technical Library), Kirtland Air Force Base, NM 87117	1
Director, Strategic Target Planning, ATTN: (JPS), Offutt Air Force Base, NE 68113	2
Defense Technical Information Center, Cameron Station, Alexandria, VA 22314	12
	42

THIS PAGE INTENTIONALLY LEFT BLANK